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Systems Thinking for Assessments: beyond 'getting the bigger picture

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Reynolds, Martin (2019). Systems Thinking for Assessments: beyond 'getting the bigger picture. In: European Environment Agency (EEA) Academy Winter School 2019, 28 Jan - 1 Feb 2019, Copenhagen.

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Systems Thinking for Assessments: beyond 'getting the bigger picture'

Martin Reynolds
The Open University

European Environment Agency

Imagine one hundred years ago…

PARIS PEACE CONFERENCE

Negotiations to End the War

"Meeting of the Allied victors at the end of WWI to set the peace terms for the Central Powers following the armistices of 1918."

…diplomats from more than 32 countries!

MAJOR DECISIONS:

- ✓ Creation of the LEAGUE OF NATIONS
- ✓ Five PEACE TREATIES with Central Powers
- ✓ Awarding of GERMAN AND OTTOMAN COLONIES to Great Britain and France
- ✓ REPARATIONS imposed on Germany
- ✓ Drawing of NEW NATIONAL BOUNDARIES (SELF-DETERMINATION)

AMERICAN APPROACH vs. EUROPEAN APPROACH

Treaty of Versailles

Paris Peace Conference

January 18 – June 28, 1919

Imagine the Treaty as a 'system':

A system to…?

A system to…?

European Environment Agency

Overview

1. Systems as imaginings: systems thinking *in* (environmental assessment) *practice*
2. Case story 1 shared imaginings: …developing capabilities
3. Case story 2 re-imaginings: …developmental evaluation
4. Summary: systems thinking *for* environmental assessments

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Publications available on Open Research Online
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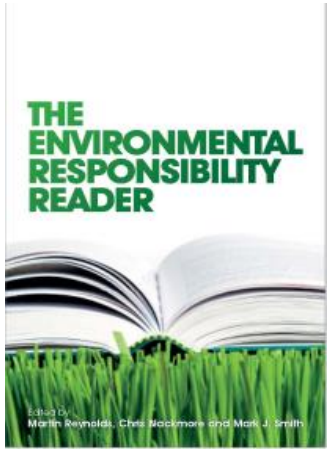

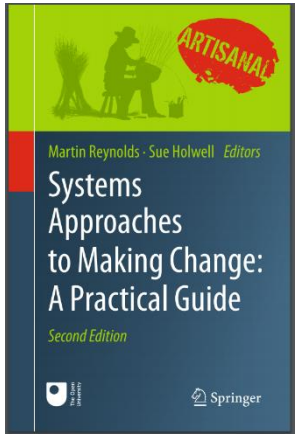

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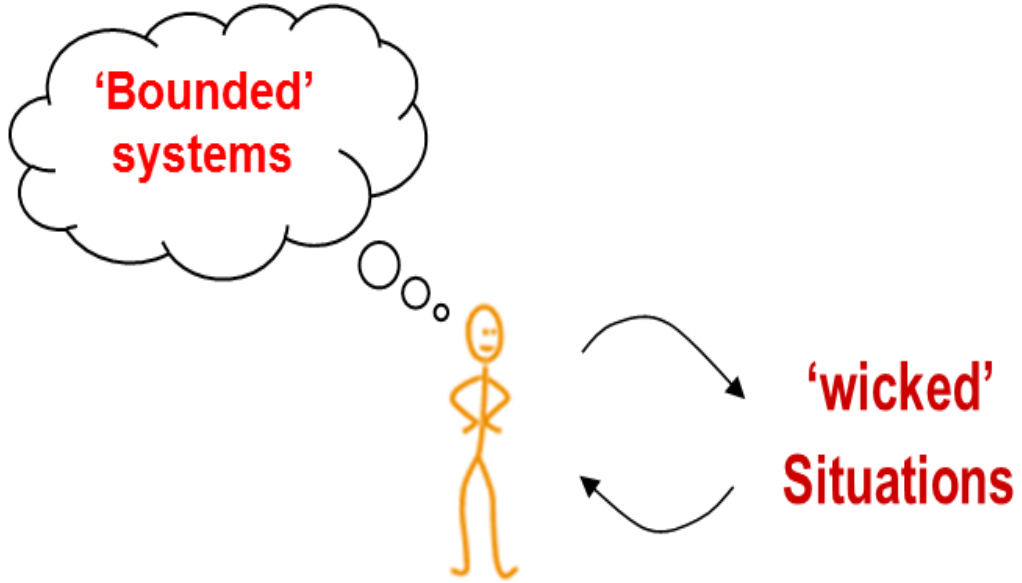
Systems and imaginings: what is a system?

Open University definition of a system: “A collection of entities that are *seen by someone* as interacting together to do something” (Morris, 2009)

Features:

1. Inter-relationships (“entities.. interacting”)
2. Perspective(s) (“seen by someone”)
3. Bounded (by purpose… “to do something”)



There are <u>two types of system</u>…. (i) purposive and (ii) purposeful

Systems thinking (x2) devices

Two devices for using ‘systems’: (i) fixed ontological with fixed purposes (purposive) and (ii) more fluid epistemological constructs (purposeful) but…

….In each case the ‘system’ is a conceptual construct

Iterating between two devices for thinking about situations as ‘systems’

1. Real world (ontological) device: *systems* as reference maps of reality

   ‘the’ health system
   an ecosystem etc.

   purposive engagement

2. An inquiry (epistemological) device: *systems* as a learning device for gaining insight to reality

   purposeful engagement

…often used together, eg. a wider bounded purposeful inquiry (system) into improving food production by reference to ecosystems, health systems etc.

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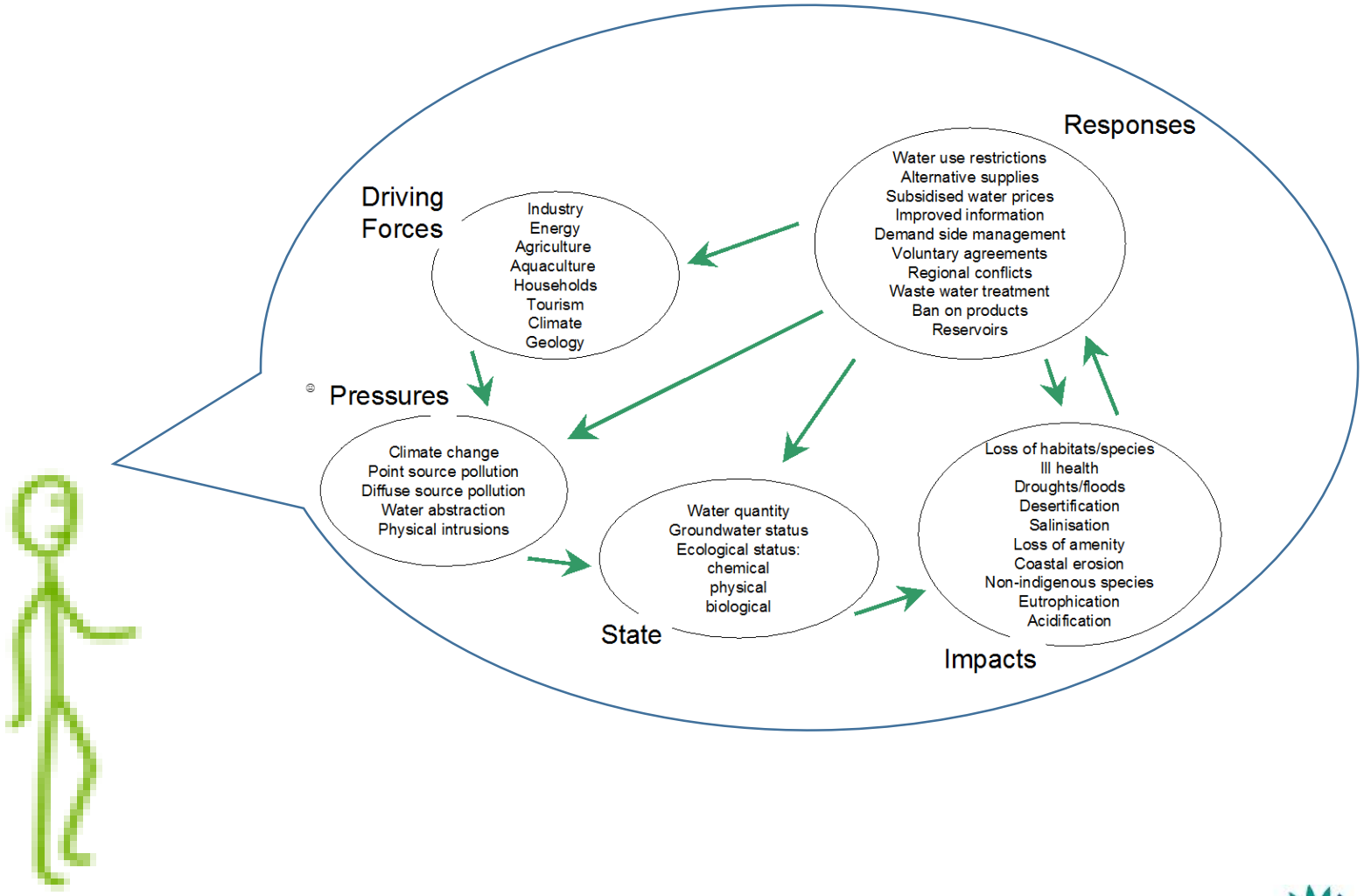
Example 1: real world ontological use of systems

DPSIR is a (reference) system; a device for understanding inter-relationships between state of the environment and other factors

The purpose of DPSIR is to provide a more systemic understanding of the state of the environment

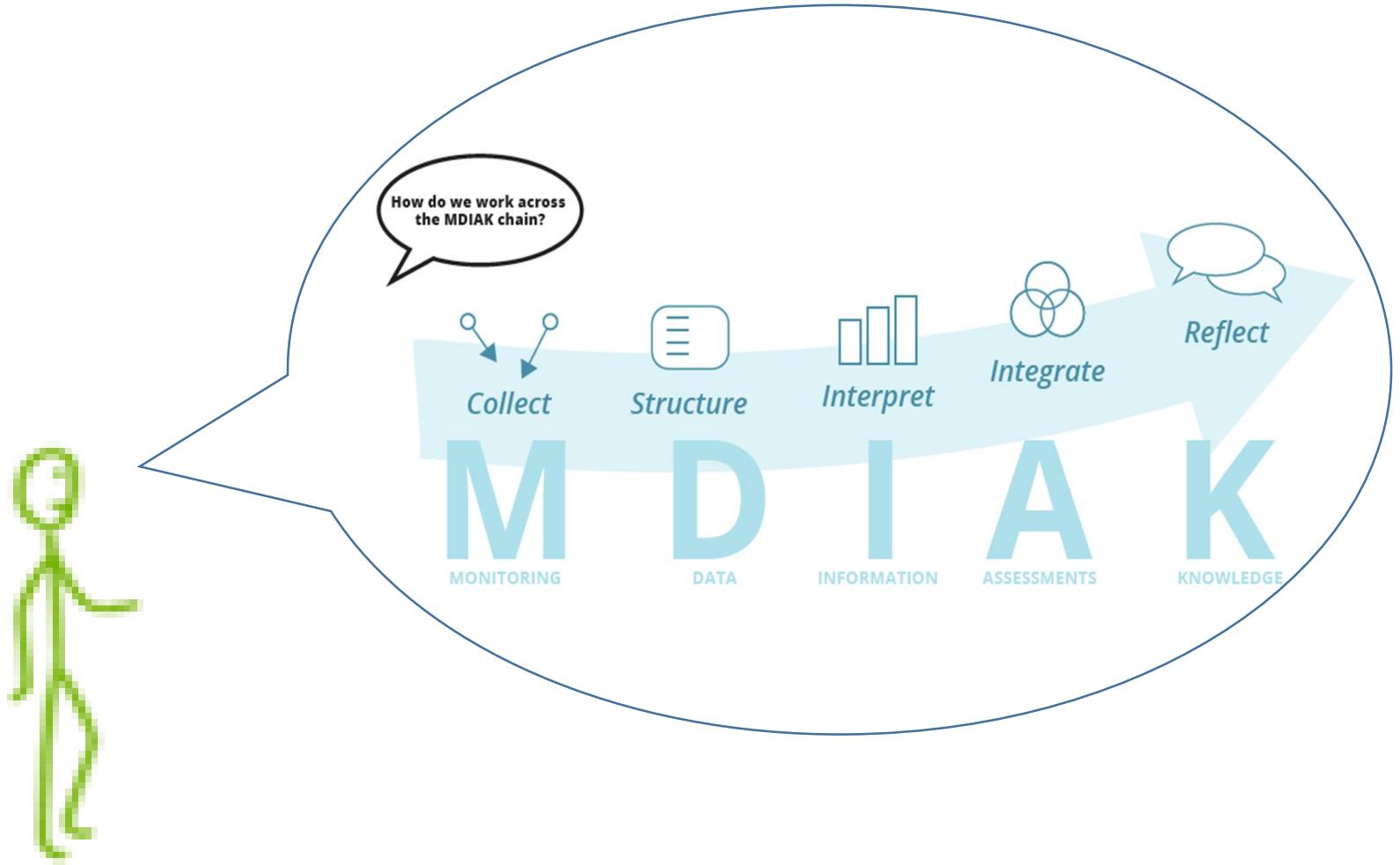


Example 2: inquiry (epistemological) use of systems

MDIAK is a system for assessing state, trends, and proposals (step 2 of assessment procedure)

Can MDIAK be used in a more non-linear (chain-like) manner?

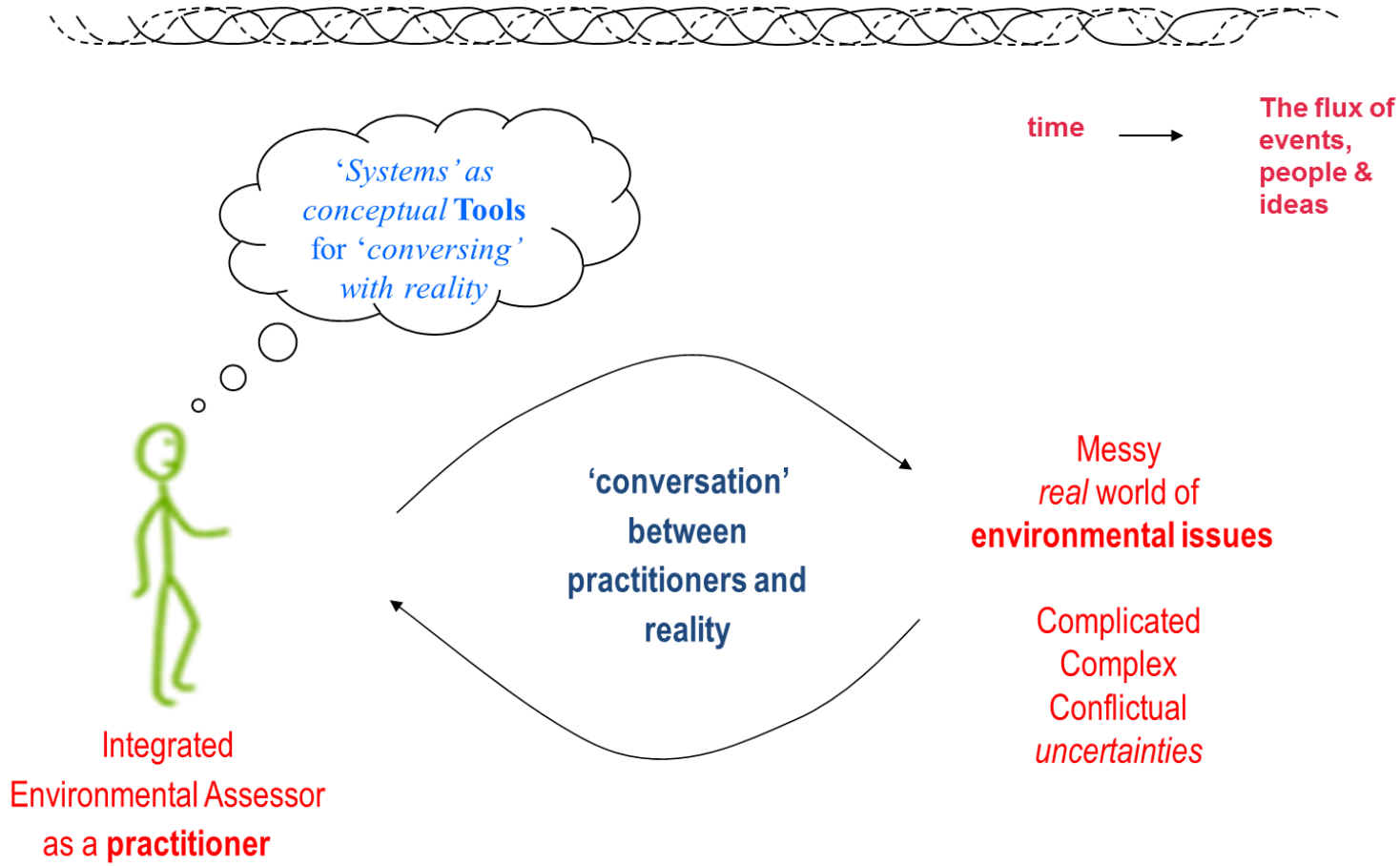
How adaptable is MDIAK as a purposeful system?



Systems thinking and imaginings

Systems thinking – an endeavour to *render* complicated, complex, conflictual ('wicked') situations into bounded (abstracted) conceptual constructs ('systems')

Systems makes *simple* (and therefore more manageable) complex situations



Systems thinking *in* practice (x2) components

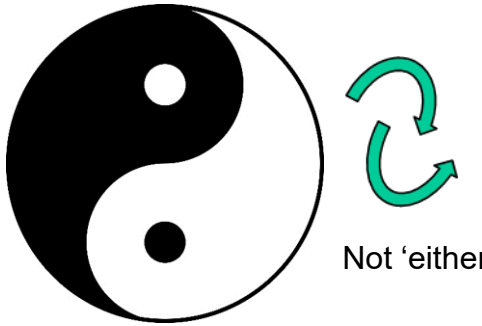
STiP involves *both*:

1. Being systemic (getting the bigger picture – holistic thinking) *and*
2. being systematic (acting through dialogue)

Iterating between seeing 'the forest' *and* 'the trees'

Systems thinking as iteration between:

1. Systemic… understanding real world (of complicatedness, complexity, and conflict)…*theory*
2. Systematic… engaging real world (e.g. listening to different perspectives)…*practice*



Not 'either/or' but 'both/and' (ying and yang)

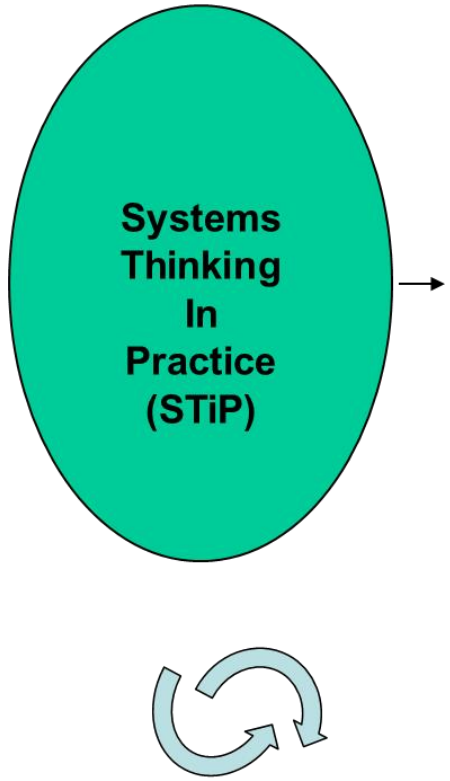
Systems thinking in practice is *praxis*

Systems thinking in practice as praxis

STiP involves both systematic and systemic attributes of praxis.

STiP praxis is an ongoing series of 'conversations'

1. Understanding Situations
2. Engaging perspectives
3. Reflecting on Systems

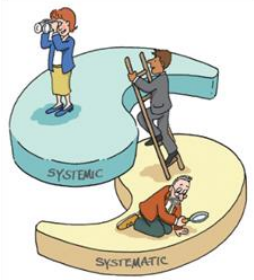


1. Thinking: 'systems' in STiP is used both as an
   - epistemological device (primarily), for *shaping reality*, ('systems thinking')

   and
   - Ontological device *representing reality* ('system-thinking')

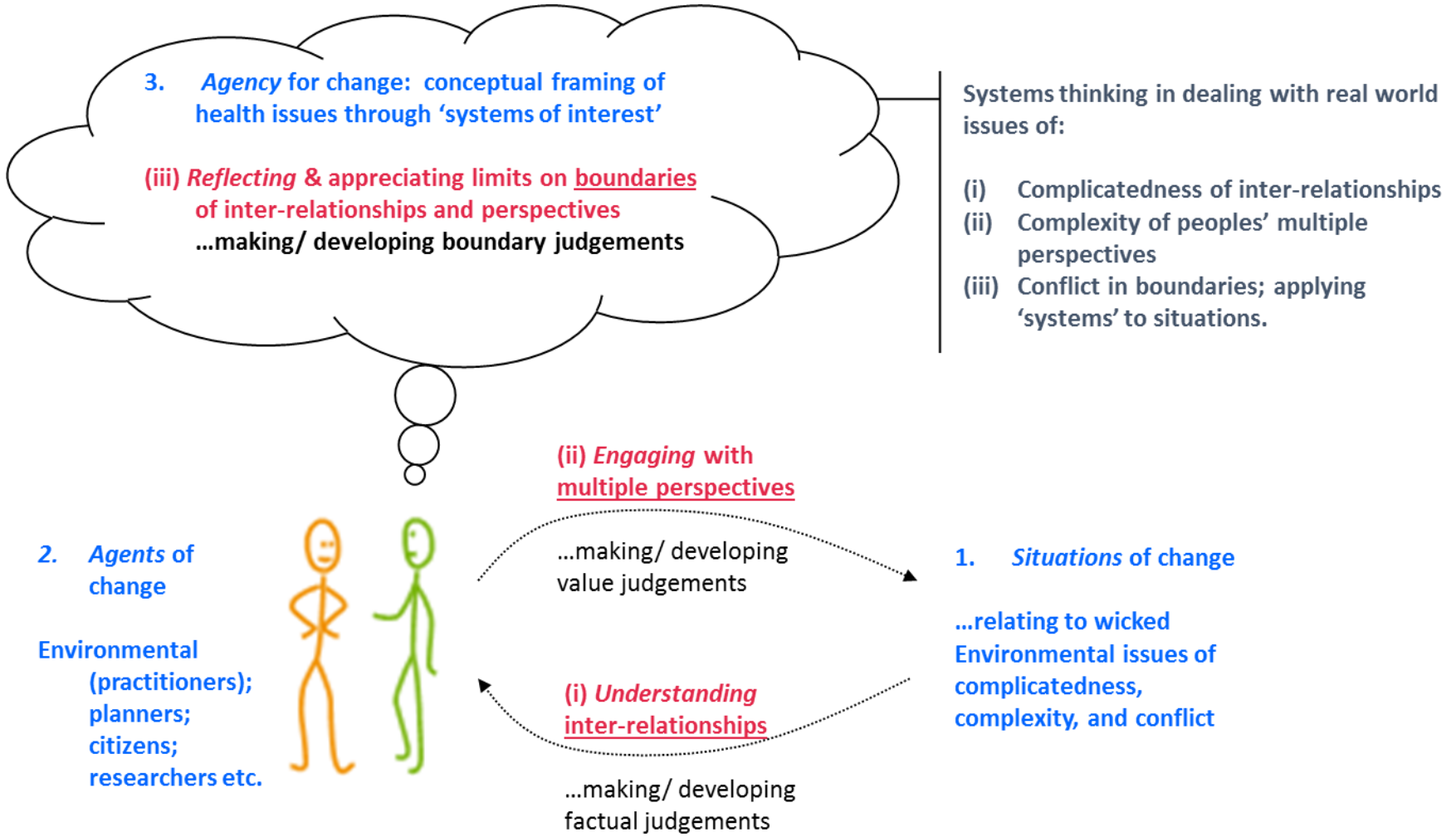
2. Practice: 'systems' in STiP is applied both
   - Systemically (primarily)

   and
   - Systematically (secondarily)



The STiP heuristic: (x3) STiP actions

1. uIR: understanding inter-relationships
2. eMP: engagaing with multiple perspectives
3. rBJ: reflecting on boundary judgements



Example 1: climate breakdown and economy

(Towards an improved) Governance system….

1. Understanding interrelationships and interdependencies

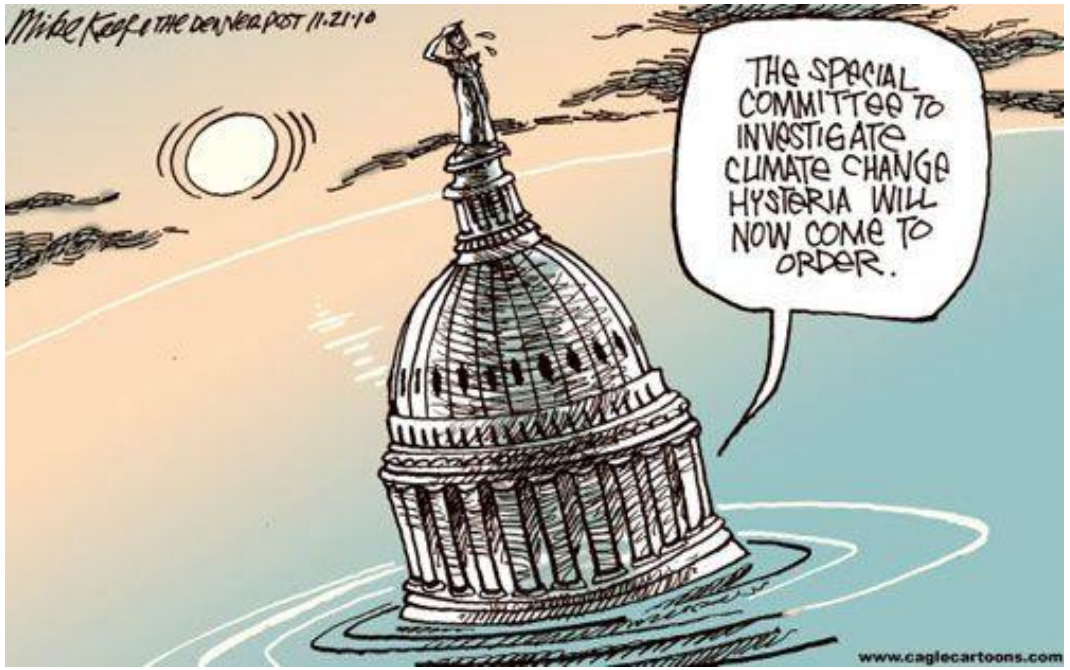
- ? Investment *and* jobs (capital crisis)
- ? Present *and* future generations (debt crisis)
- ? Instrumental *and* intrinsic (values)
- ? Etc.

2. Engaging with multiple perspectives

- ? Non-human stakeholders
- ? Commercial (single line responsibility: economic)
- ? Media (double line responsibility: economic/social)
- ? Politicians (triple line responsibility: regulation)
- ? Etc.

3. Reflecting on boundaries

- ? Doing the wrong things righter (clean coal…'try harder')
- ? Models of economy (growth or distribution)
- ? (natural) Capitalism (other configurations of labour, natural capital, value)
- ? Etc.



Example 2: pesticides on food production

(Towards an improved) Farming system….

1. Understanding interrelationships and interdependencies (issues)

- ? Systemic pesticides (e.g. neonicotinoids)
- ? (other) Causes of bee colony collapse (habitat degradation/ biodiversity loss/ pests)
- ? Issues of food security (vis a vis ecological, water, energy security)
- ? Etc.

2. Engaging with multiple perspectives (values)

- ? Farmers and environmentalists
- ? Chemical industry ((Syngenta/ Bayer group) and organic industry (cf. Greenpeace)
- ? Current and future generations
- ? Etc.

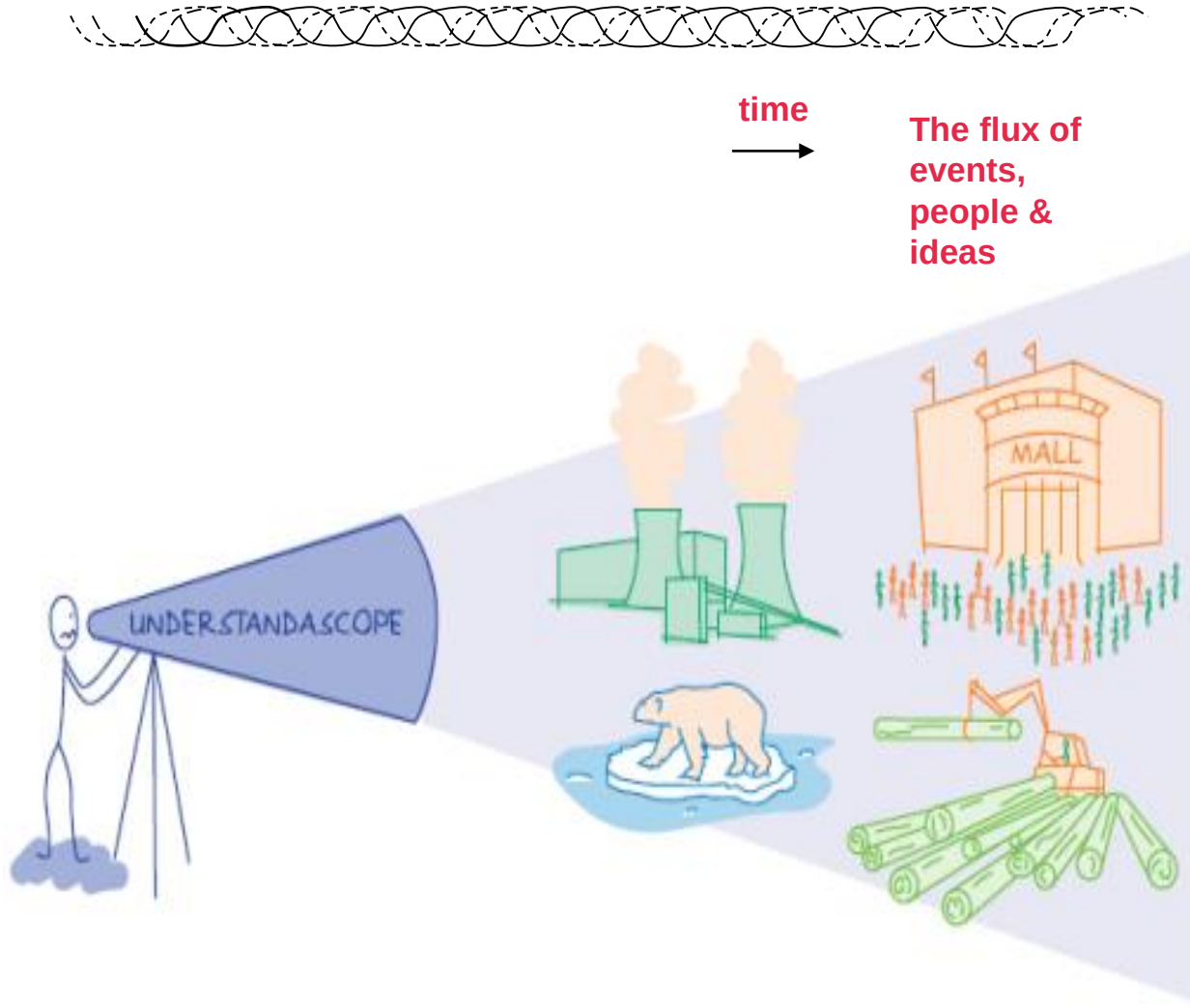
3. Reflecting on boundaries (models)

- ? Technocentric (quick fix) vs deliberative (political) models
- ? Models of economy (growth/ capitalism or well-being/ post-capitalism)
- ? Supply driven (farm production) vs demand focus (reducing food waste) models
- ? Different regulatory models/bodies (national/ international)
- ? Etc.

(STiP) Action 1: understanding Inter-relationships

Getting the bigger picture (avoiding reductionism):

- Dealing with the complicatedness of wicked situations
- *(systems) Diagramming
- stakeholder mapping
- Gathering different perspectives …

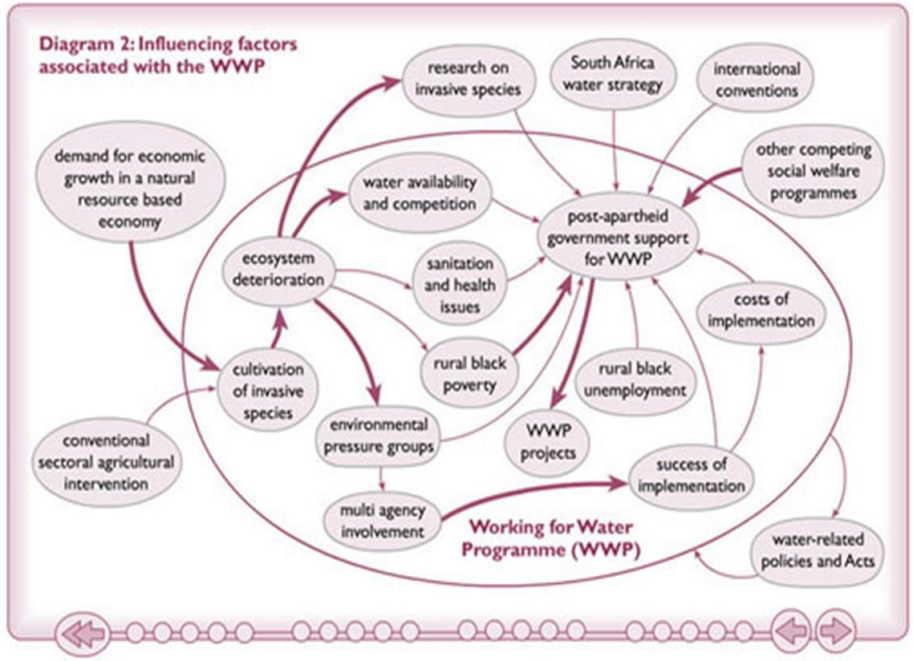


Understanding inter-relationships -1

*Systems diagramming: Open University free resources: ‘Diagramming for development’ on OpenLearn. Working for Water Programme (WWP): animated tutorials on six diagram types

Diagramming for development – 1 Bounding realities (WWP – rich pictures, spray diagrams, system maps
http://www.open.edu/openlearn/science-maths-technology/computing-and-ict/systems-computer/diagramming-development-1-bounding-realities/content-section-0

Diagramming for development – 2 Exploring relationships (WWP– influence, multiple–cause, cognitive mapping
http://www.open.edu/openlearn/science-maths-technology/computing-and-ict/systems-computer/diagramming-development-2-exploring-interrelationships/content-section-0



Exaample: Diagramming for development – 2: influence diagram for WWP

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Understanding inter-relationships -2

Gathering different perspectives through ‘snappy’ systems

List some snappy systems associated with Integrated Environmental Assessment (IEA) from different perspectives:

A system to…

- several ‘positive’ systems from different perspectives
- several ‘negative’ systems (?)

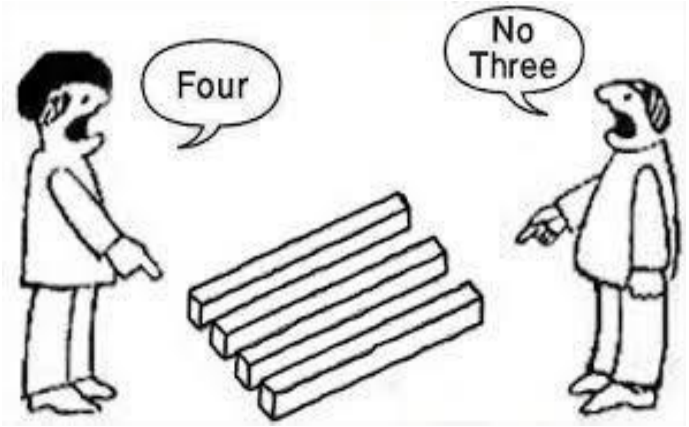
(WWP = wicked problem) …many perspectives e.g an intervention regarded as

a system to …

- Provide rural employment
- Alleviate poverty
- Improve biodiversity
- Remove alien species from waterways
- Perpetuate rural poverty (?)
- Accentuate economic divide (?)
- Limit urbanisation - migration to cities (?)

(STiP) Action 2: engaging multiple perspectives (eMP)

Gathering different perspectives with simple systems?



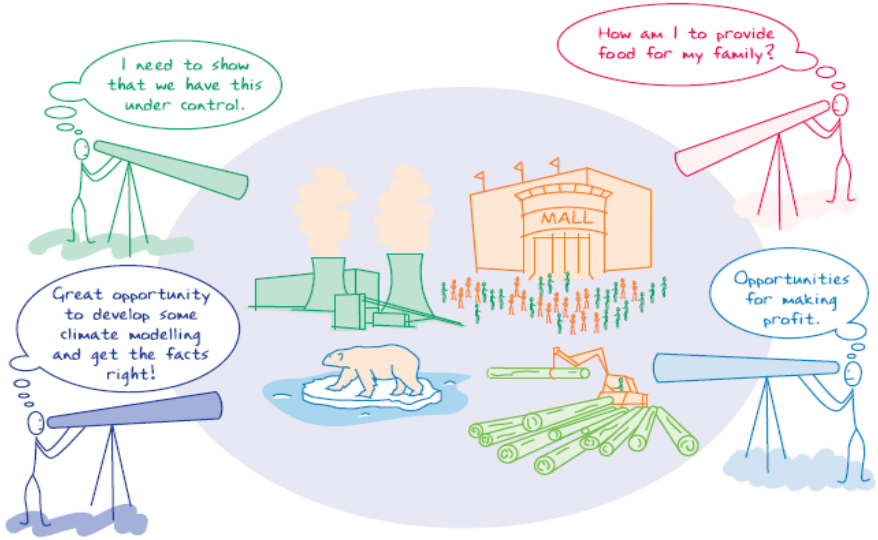
"The core aspects of systems thinking are
1. (gaining a bigger picture (going up a level of abstraction) and
2. appreciating other people's perspectives"
Jake Chapman (2004)

"A systems approach begins when first you see the world through the eyes of another"
C. West Churchman (1968)

Simple systems (articulating perspectives in terms of systems)

- *what* does the system do?
- *how* should the system do it?
- *why* is the system useful or important?

A system to do *P* by means of *Q* in order to *R*



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eMP- using ‘simple systems’

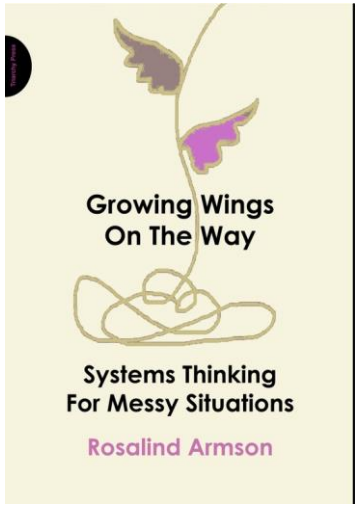
Gathering perspectives for the working for water programme (WWP)

- *what* does the system (WWP) do?
- *how* should WWP do it?
- *why* is WWP useful or important?

A system to do *P* by means of *Q* in order to *R*

for example WWP might be described as:

a system to reduce invasive plants by means of multiple projects in order to support development in South Africa



Chapter : What? How? Why?

But various possible perspectives on the programme (‘systems’) might be modelled depending, for example on:

1 differences in focus on *interests*: economic development, social justice, ecological protection.....
2 differences in focus on *stakeholder groups*: intended beneficiaries, decision makers, experts/consultants...

eMP- modelling (x3) different interests

Gathering perspectives for the working for water programme (WWP)

- *A system to…*
- *By means of….*
- *In order to….*

Model 1 perspective: Economic development

What	Preserve water as a key resource for economic development
How	Mobilise unemployed communities for manual clearing of water catchments
Why	Sustainable national water security accompanying food and energy security

Model 2 perspective: Social justice

What	Promote equitable access to clean water
How	Local participation and empowerment in programme/project management
Why	Reassert disenfranchised rights of black South Africans

Model 3 perspective: Ecological protection

What	Reduce population of invasive species in water catchment areas
How	Use as effective a means as possible including mechanised tools
Why	Preserve biodiversity of vulnerable ecosystems

eMP- modelling (x3) different stakeholders

Gathering perspectives for the working for water programme (WWP)

- *A system to…*
- *By means of….*
- *In order to….*

Model 4 perspective: Intended beneficiaries (effective management)

What	Reduce rural unemployment and improve rural livelihoods
How	Invest effectively in South African black rural communities
Why	For poverty alleviation and social justice

Model 5 perspective: Decision makers (efficient management)

What	Mobilise necessary resources including international finance
How	Use as efficient a means as possible including low-cost labour
Why	Secure control over ecological preservation and ecological services

Model 6 perspective: Experts (assured management)

What	Ensure appropriate expertise to support WWP
How	Use a wide range of different expert groups with appropriate know-how
Why	To provide assurances and lessen uncertainty regarding programme implementation

eMP: using PQR for assessing climate change

Twelve perspectives on Climate Change Adaptation (CCA) research

Table 3 Constructed root definitions (RDs) of [x12] participants' 'system of interest' in CCA research

…based on responses to interview questions

…(any sequence across the three columns should be read as 'a system to do P (what) by Q (how) because of R (why)')

(Grant et al., 2019 p.15)

What (P)	How (Q)	Why (R)
To provide decision support	…by narrowing the problem complexity	…to help farmers adapt to climate change
To understand the impact of climate change on plant physiology	…by experimenting with parameters of temperature, carbon dioxide and water	…to improve or maintain food qualities and productivity
To understand opportunities arising from change	… by recognising alternative farming systems inputs, e.g., for high protein diets	…to facilitate on-farm capability for adaptation
To extend climate knowledge through rural stakeholders	… by providing basic climate and emissions education	...to improve the literacy of farmers on climate change
To respond to changes in policy agenda	… by translating existing capability and to better target capability	…to meet varying stakeholder knowledge needs and interests
To increase the ability for new thinking and innovation	…by providing opportunities for new conversations	…to develop strategic options for adaptation (including mitigation)
To embed change into good government policy as something we have to respond to	… by recognising standards in the effects of actions taken	…to reflect and adapt policy according to evaluation of effects of action taken
To move beyond marginal adjustment stymied by doubt and uncertainty	…by realising efficiencies against a changing competitive environment and resource constraints	…to enable 'step change' or confidence in driving action towards transformation
To support the transition to a low carbon economy	…by recognising the socio- economic effects of changes in the environment	…to encourage innovative practice and new technologies in response to change
To create awareness of climate change issues and adaptation and mitigation options	…by engaging communities in discussion on issues around climate change	…to hear what the concerns of farmers are and feed that back into the design of R&D
To develop germplasm suited to new climatic conditions	…by identifying traits and management practices needed for changed environments	…to maintain production under changes climate conditions
To help stakeholders better understand implications and opportunities and feed their perspectives back into science and extension	…by engaging with and consulting peak industry bodies	…to encourage understanding of climate impacts and support industries in realising opportunities to increase profitability

Enabling Political Legitimacy and Conceptual Integration for Climate Change Adaptation Research within an Agricultural Bureaucracy: a Systemic Inquiry

Andrea Grant, Ray Ison, Robert Faggian & Victor Sposito (2019)

Systemic Practice and Action Research 26 (5)

eMP: engaging perspectives on IEA

Engaging perspectives for ‘integrated environmental assessment’ (IEA)

Model your understanding of IEA as a system of interest…

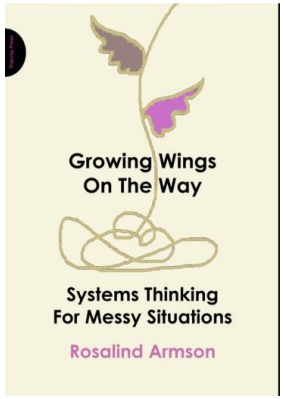
- *what* does the system do?
- *how* should the system do it?
- *why* is the system useful or important?

A system to do *P* by means of *Q* in order to *R*

Compare and contrast your model of IEA as a system of interest with a colleague… Try deriving a shared model

Example from Armson: A system for planting a tulip bulb

- *what* should the system do?
  - ⇨ *create a hole in the garden*
- *how* should the system do it?
  - ⇨ *using a spade*
  - ⇨ *using a hand trowel*
  - ⇨ *bringing in a digger*
  - ⇨ *using explosives*
- *why* is the system useful or important?
  - ⇨ *to plant a tulip bulb*



The ‘why’ is the wider context that gives the ‘what’ a meaning. It allows for coherence between *how* something is done and *why* it is being done. Designing a system is best done through sequencing what/why/how

Case Story 1: perspectives and capabilities

Research project: Transforming curriculum praxis and capabilities

…changing the way the game is played

3rd action research project sponsored by eSTEeM (OU STEM Centre for Pedagogy

Aim: (Capabilities approach) shifting from developing 'competencies' based on learning outcomes (playing 'the game' better) towards enhancing 'capabilities' - creating innovative space for redefining occupational, professional, and social roles and practices amongst stakeholders in the workplace

(changing the way 'the game' is played)?

"It is not about being the best at playing the game … but more about changing the way the game is played …

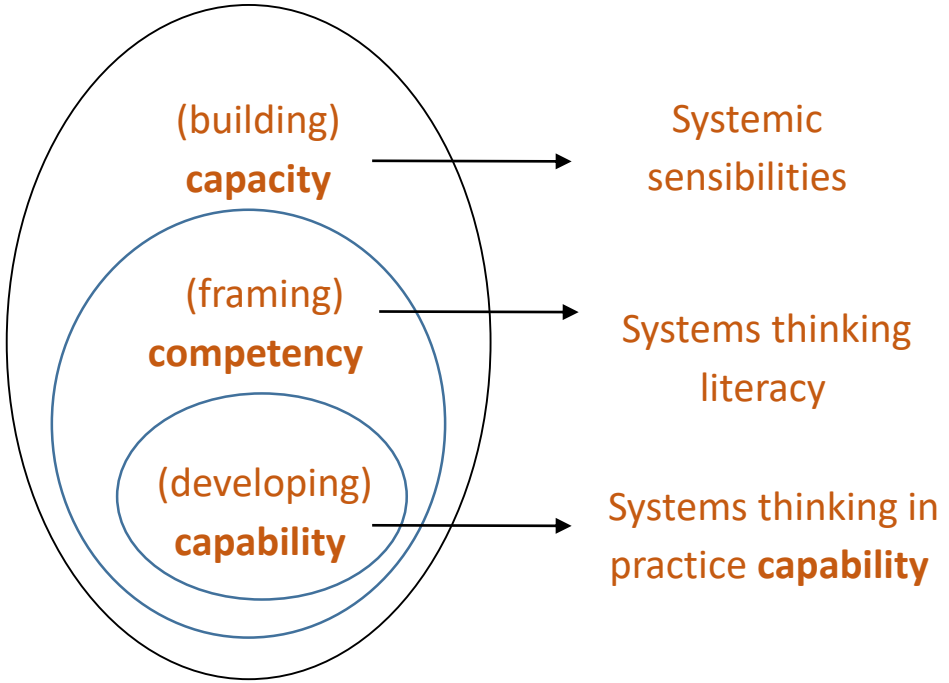
…while having fun in the process"

(Sports journalist, Guillem Balague, 16th April 2018. BBC

Developing competence & capabilities

Engaging multiple perspectives (joined-up thinking-in-practice)

- Postgraduate STiP alumni students post-study experiences in application of systems thinking competencies (systems literacy) in the workplace
- Shifting from safe-fail learning environment (OU) to less forgiving fail-safe workplace environment
- Dealing with the complexity of wicked situations; i.e. engaging with wider stakeholders in workplace situations
- Promote purposefulness and avoid talking at cross purposes



From purposive competencies towards purposeful capabilities

Ensuring rigour through appropriate levels of capabilities

Developing rigour in assessment criteria

False Guarantors:

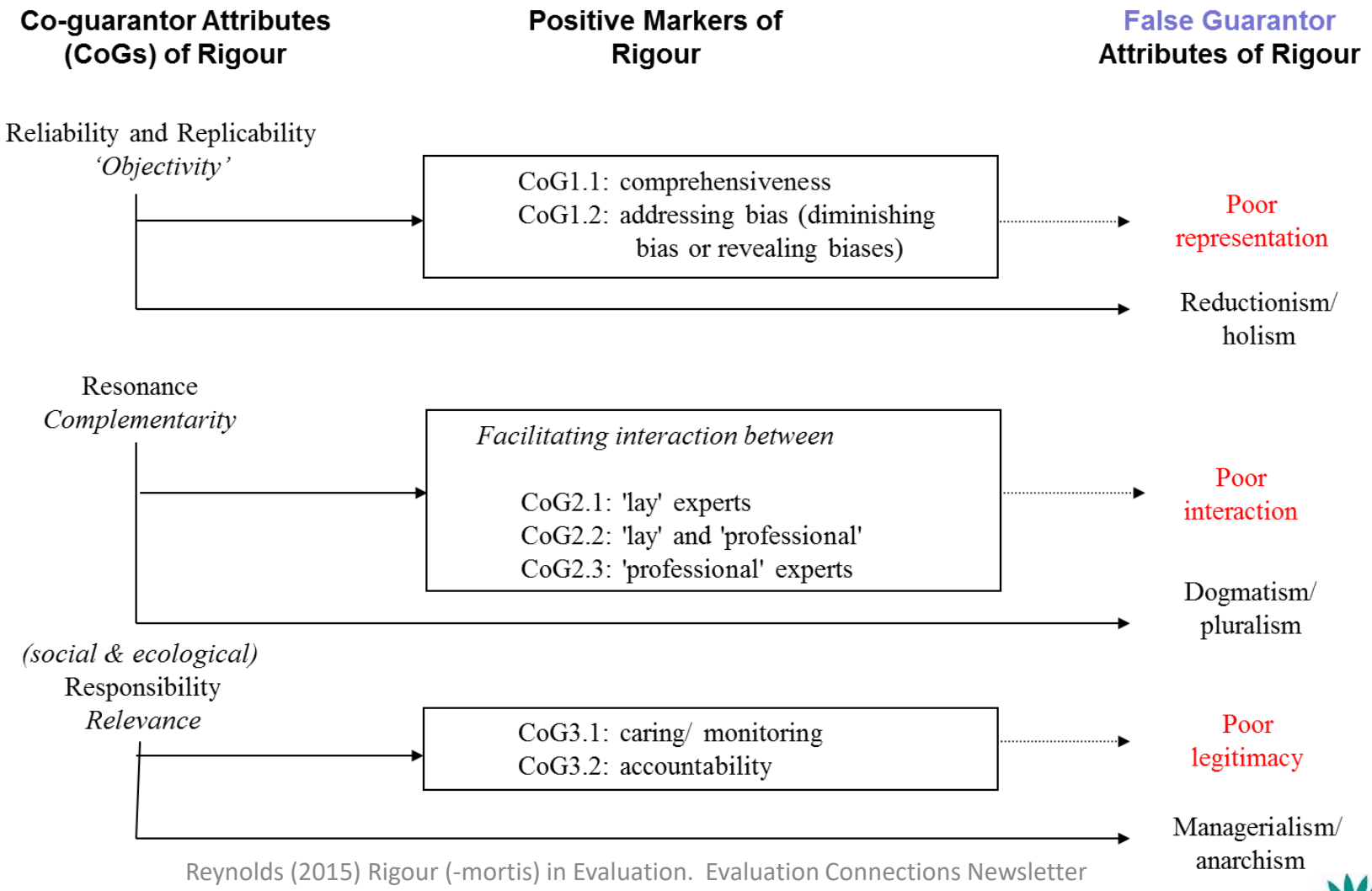
(i) not fulfilling capabilities;

(ii) privileging one capability type

Integrated Assessments:

1. Credible (CoG 1)
2. Salient (CoG 2)
3. Legitimate (CoG3)

Ensuring rigour through engagement with multiple perspectives at appropriate levels of capabilities beyond 'best practice'



Reynolds (2015) Rigour (-mortis) in Evaluation. Evaluation Connections Newsletter

Towards developing capabilities in IEA…

Competency approach

1. Developing instrumental value at an individual level
2. Subject primarily to prevailing economic market demand and measures of efficiency
3. In a technocentric results-oriented (fail-safe) culture of career professional progression and purposiveness
4. With transparent measurable (evidence-based) assessment criteria
5. …with privileged focus primarily on guarantors of ‘credibility’ and objectivity)

Capabilities approach

1. Developing system-wide intrinsic value (including confidence to act and make appropriate choices)
2. Subject to societal and ecological responsibilities and measures of wider effectiveness
3. In a democratic deliberative (safe-fail) culture of public work and purposefulness
4. With criteria that may not always be easily measurable
5. …with privilege focus more on co-guarantors; including saliency and legitimacy, addressing multiple perspectives

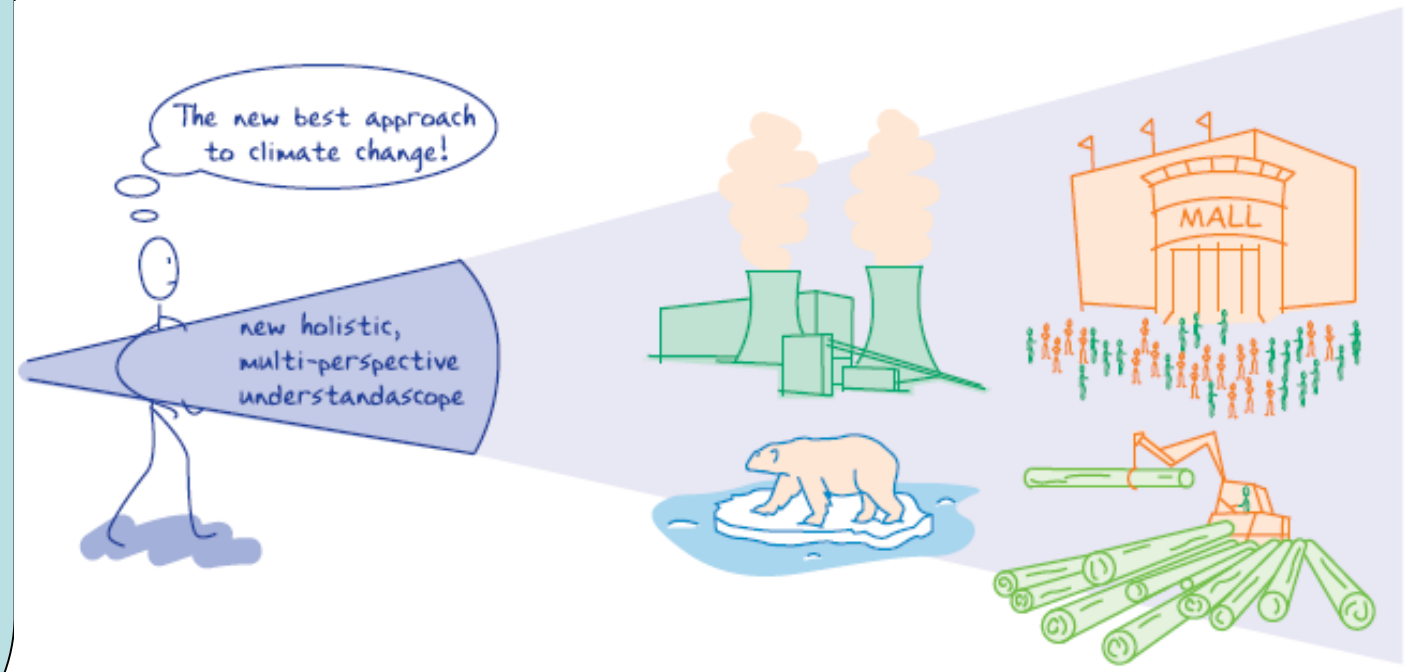
Effective Integrated Environmental Assessments: Credible (CoG 1)…Salient (CoG 2) Legitimate (CoG3)

(STiP) Action 3: reflecting on boundary judgements (rBJ)

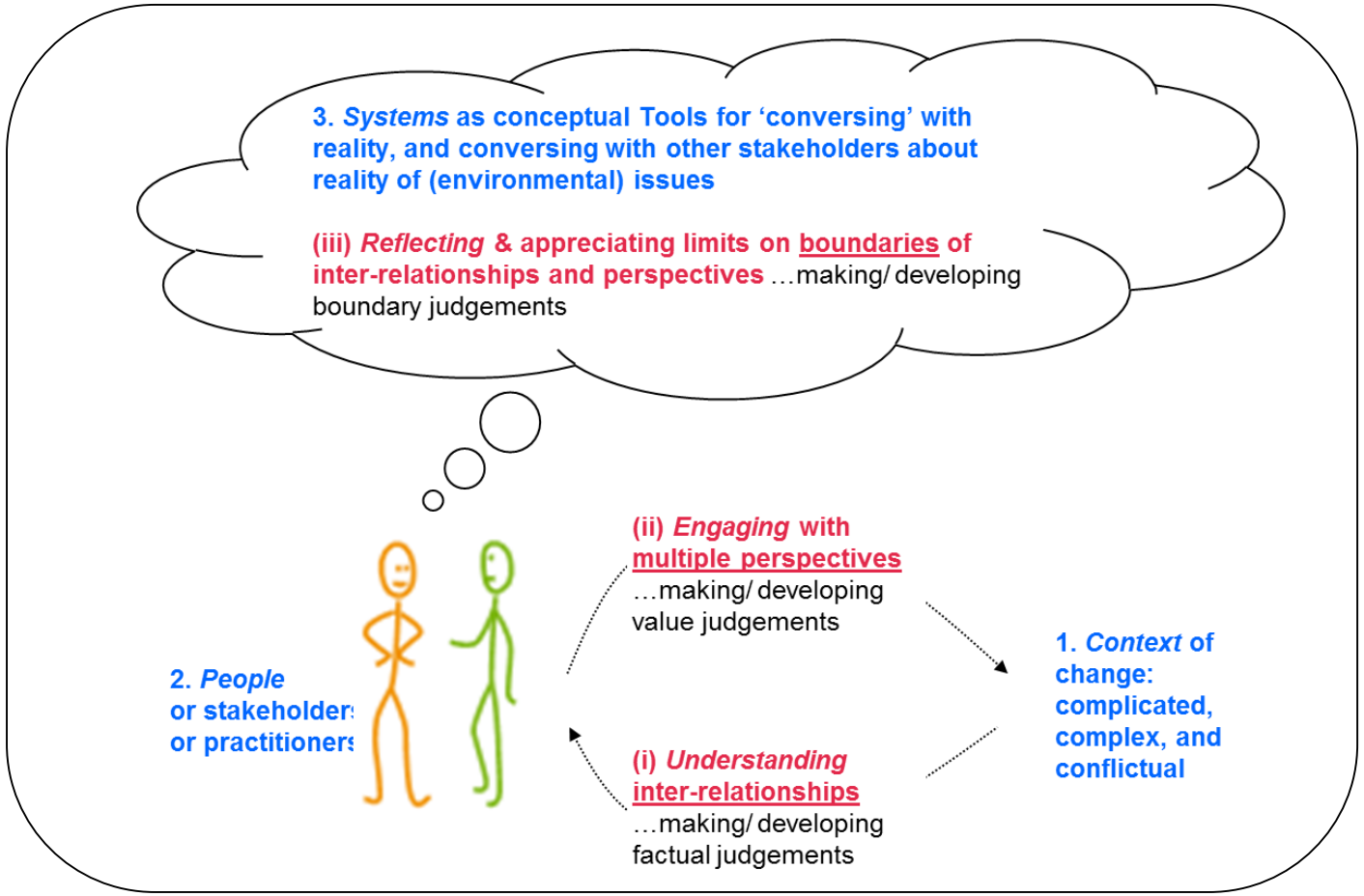
Reflecting on inevitable *partiality* in practice:

1. … *partial* understanding of inter-relationships (not cognitively possible to be wholly 'holistic'…we have limits)

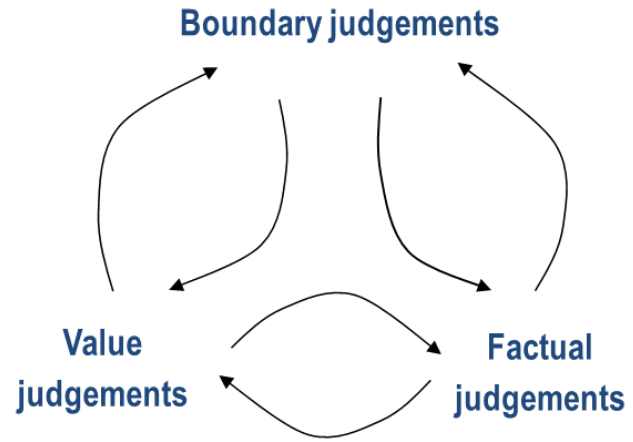
2. … *partial* engaging with multiple perspectives (not possible to be impartial or 'neutral'… we all have biases)



rBJ: Systemic triangulation of judgements



Systems Thinking in Practice heuristic (epistemological device)



Boundary critique
Reynolds (2007) adapted from Werner Ulrich (2003)

Systemic triangulation (ontological device)

rBJ: rigour or rigor-mortis?

Treaty of Versailles

Paris Peace Conference

January 18 – June 28, 1919

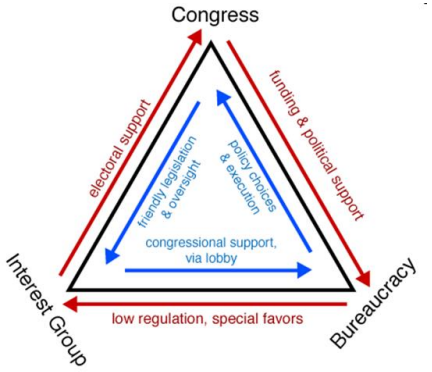
Imagine the Treaty as a 'system'….

1. Factual judgements: vanguished not included
2. Value judgements: restrictive perspectives of 4 countries – France, UK, USA, Italy
3. Boundary judgements: Peace process as 'a system' failed to gain civil legitimacy

"If the Peace Conference is allowed to remain between governments instead of between peoples it is apt to degenerate…"

The Iron Triangle (Ralph Pulitzer 1919)

The military industrial complex (Eisenhower, 1961)



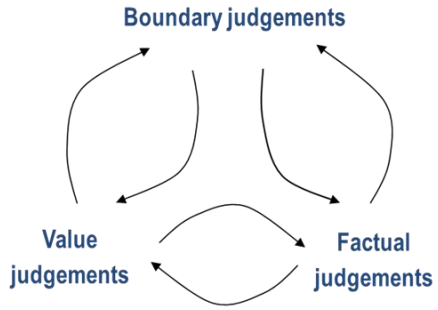
Three generic dimensions	(original) **Paris Peace Treaty (1919)**	**Military-industrial complex (1961)**
1. Inter-relationships (contexts)… the hammered	(on the ground) professional soldiers of victors (militarism)	Bureaucracy
2. Perspectives (people)… the hammerers	Interests of military industry (materialism)	Interest groups
3. Boundaries (ideas/tools)… the hammer(s)	Decisions of politicians (bourbonism)	Decisions of Congress

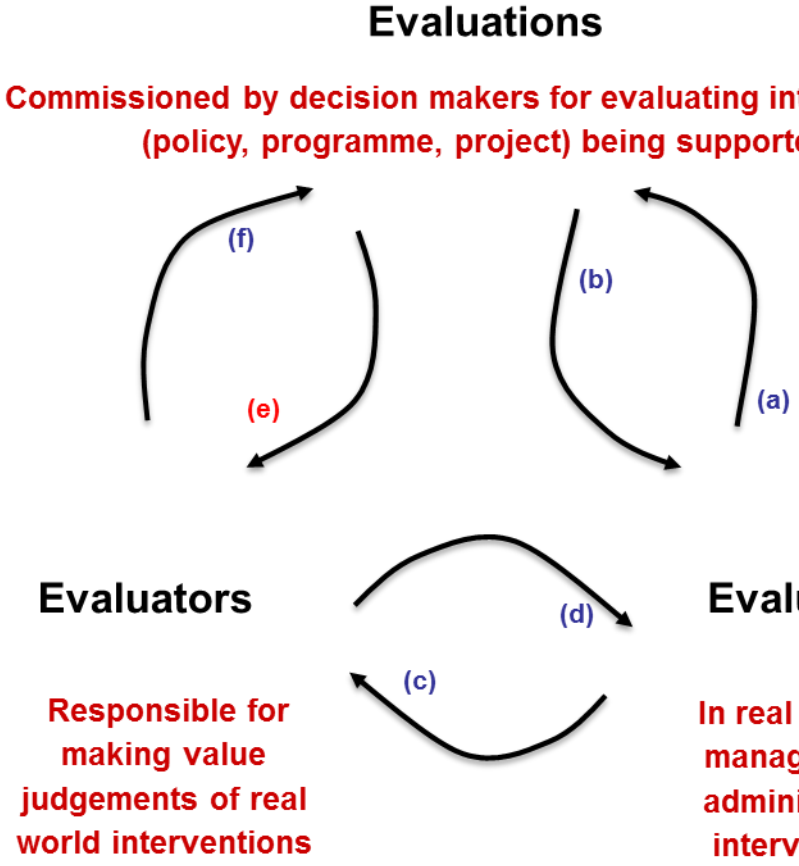
Case Story 2: developmental evaluation

Imagine Evaluation (or IEA) as a systemic 'system' of making judgements…

1. Factual judgements:
2. Value judgements:
3. Boundary judgements:

Adapted from Reynolds, M. (2015). (Breaking) The iron triangle of evaluation. *IDS Bulletin*, 46(1) pp. 71–86.





Six activities:

(a) auditing

(b) planning

(c) evaluating (summative)

(d) evaluating (formative)

(e) Commissioning… need for 'rigour'

(f) learning

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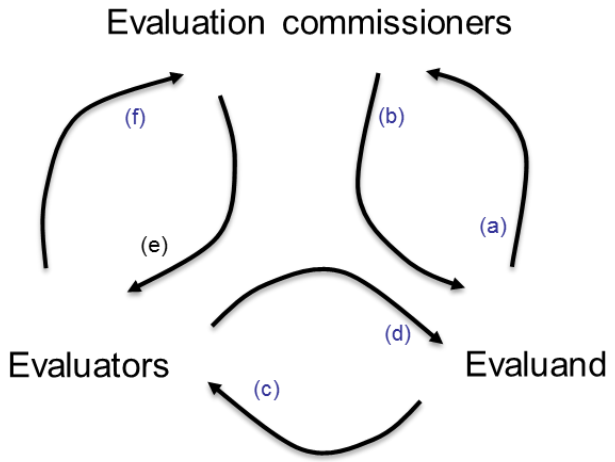
Comparing two models of assessment

Comparing evaluation (assessment) in practice as:

(existing) Evaluation-industrial complex (purposive)
(proposed) Evaluation-adaptive complex (purposeful)

Actions assessed …associated with Evaluand	Descriptive (actual) 'is' perspective Evaluation-industrial complex Transformation From…	Ideal (normative) 'ought' perspective Evaluation-adaptive complex To…
a) Audit Check:	Situations systematically recognised as either simple, complicated (tame), or complex (wicked)	Situations systemically viewed as comprising all of (i) complicatedness (ii) complexity and (iii) conflict
b) Plan: terms of reference	Purposive …fixed goals and targets as ascribed measures.	Purposeful - agile, flexible, adaptive measures
..etc. c), d), e), and f)		



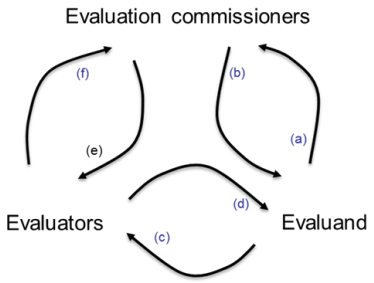
Reynolds, M. (2015). (Breaking) The iron triangle of evaluation. IDS Bulletin, 46(1) pp. 71–86.

Re-imagining models of assessment

Being systematic(proposed) Evaluation-adaptive complex (purposeful)

X3 ethical principles of systems thinking in assessment practice based on systemic triangulation

1. Embrace humility (inter-relationships)
2. Practice empathy (multiple perspectives)
3. Accept fallibility (boundary judgements)



X6 'operating principles' of systems thinking in evaluation (assessment) practice

a) (audit) start systemically (all situations having complications, complexities, and conflict)

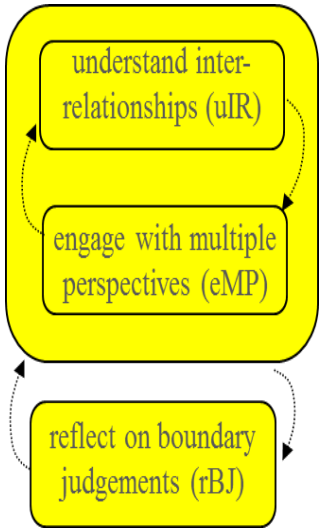
b) (plan) keep objectives flexible in time (cf. adaptive action.. Glenda Eoyang)… purposeful

c) (evaluation summative) attend to ethical criteria of wellbeing… who might be the victims? …as against 'efficiency'

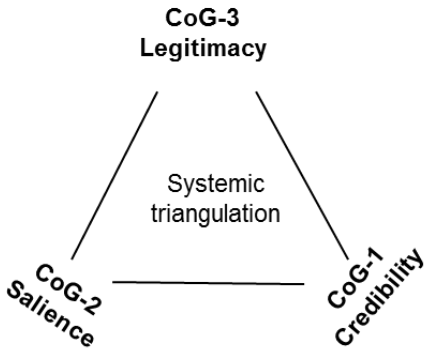
d) (evaluation formative) privilege power-to and power-with relations (rather than power-over relations)

e) (commissioning) provide robustness/ rigour without rigor-mortis (trapped in one co-guarantor of 'objectivity' at expense of other co-guarantors

f) (learning) generate learning that questions ethics (doing the right thing) as well as politics (power and knowledge…who determines what's right?)

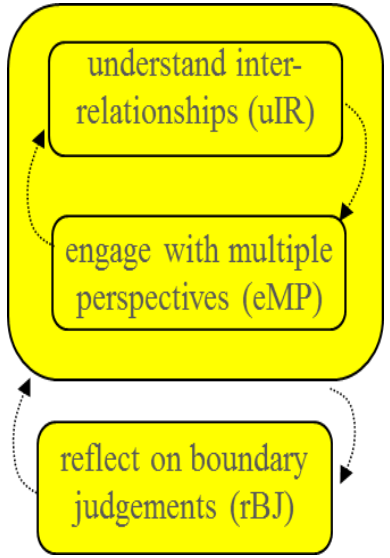


Re-imagining models of assessment

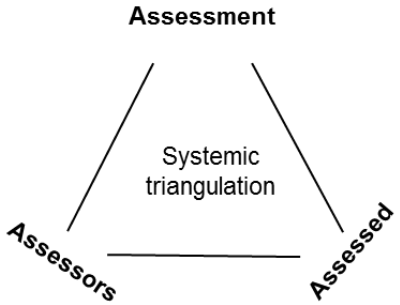


Case story 1: Assessing capabilities

- Reynolds, M. and Shah, R (2018). Researching capability development: developing systems thinking in practice capabilities. In: Symposium on Governing Complexity: developing appropriate praxis with citizens and organisations, 12 Jun 2018, Milton Keynes, The Open University
- Reynolds, M. Shah, R. and van Ameijde, J (2018). Framing systems thinking in practice competencies: report on systems thinking in practice competencies workshop 10 June 2017. The Open University. Milton Keynes
- Reynolds, M.; Blackmore, C.; Ison, R.; Shah, R. and Wedlock, E. (2017). The role of systems thinking in the practice of implementing sustainable development goals. In: Leal Filho, Walter ed. Handbook of Sustainability Science and Research. Springer, pp. 677–698.
- Reynolds, M.; Shah, R.; Wedlock, E.; Ison, R. and Blackmore, C (2016). Enhancing Systems Thinking in Practice at the Workplace: eSTEeM final report. The OU Centre for STEM Pedagogy. The Open University, Milton Keynes



Case story 2: Assessing evaluation-in-practice



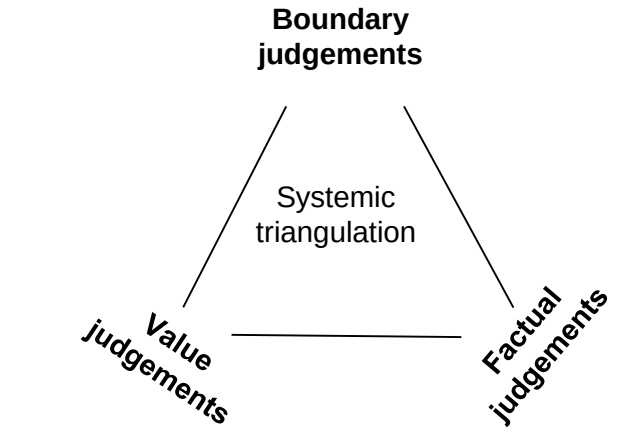
- Reynolds, M. (2017). Evaluating diagramming as praxis. In: Oreszczyn, Sue and Lane, Andy eds. Mapping Environmental Sustainability: Reflecting on systemic practices for participatory research. University of Bristol: Policy Press, pp. 207–230
- Reynolds, M. and Schwandt, T. (2017). Evaluation as public work: an ethos for professional evaluation praxis. In: UK Evaluation Society Annual Conference: The Use and Usability of Evaluation: demonstrating and improving the usefulness of evaluation, 10-11 May 2017, London, UK Evaluation Society.
- Reynolds, M. (2015). Rigour (-mortis) in evaluation. Evaluation Connections: The European Evaluation Society Newsletter, June 2015, Special Edition, pp.2-4.
- Reynolds, M. (2015). (Breaking) The iron triangle of evaluation. IDS Bulletin, 46(1) pp. 71–86.

Shared imaginations & systems thinking

Nexus thinking (i.e. 'framings' over space)

1. Science: environmental/economics/social
2. Policy: food/water/energy (+ environmental security

Science – policy – society (nexus)



Historic thinking (i.e. 'framings' over time)

1. Science… Paradigms (Kuhn, 1962)
2. Policy…… Muddling through/ social learning (Friedman, 1997)
3. Society… Shared imaginations/ homo deus/ anthropocene (Harari, 2018)
   - e.g. religions, nations, tribes, family, economics, health security,
   - e.g. economic systems, health systems, ecosystems etc.

Systems thinking in practice (special form of sharing imaginings over space *and* time)

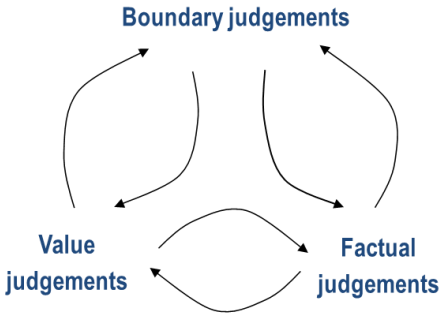
1. Purposeful systems *with* Purposive systems
2. Systematic thinking *with* Systemic thinking

Imagine being a STiP IEA practitioner….

Juggling with (2 balls of…) dualities

engaging multiple perspectives (eMP)	*and*	understanding inter-relationships (uIR)
value judgements	*and*	factual judgements
epistemological drive (knowing)	*and*	ontological drive (knowns/ unknowns)
systematic	*and*	systemic
perspective/perception	*and*	inter-relationships, perspectives, boundaries
practice	*and*	knowledge
action	*and*	research
meaning	*and*	evidence
humanities	*and*	sciences
trust	*and*	truth
empathy	*and*	humility

All mediated through reflection on (3rd ball of…)
boundary judgements



Systems praxis
…or ‘bricolage’ making improvements with existing tools

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+ having fun in the process

Summary

1. Systems as imaginings: systems thinking *in* (environmental assessment) *practice* comprises systemic *and* systematic thinking in understanding inter-relationships (uIR)

2. Shared imaginings: requires engaging with multiple perspectives (eMP) using systems as devices…developing capabilities

3. Re-imaginings: requires reflecting on boundary judgements (rBJ) towards ongoing …developmental evaluation

4. Systems thinking *for* environmental assessments involves bricolage – making use of existing available skills and tools for uIR, eMP, and rBJ

Martin Reynolds

The Open University

Information on STiP modules

Publications available on Open Research Online

Systems thinking resources available online

…including free Badged Open Course

Badged open online free course

24 hours study
8 weeks
(x3 hours per week)

European Environment Agency

Thank you!

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